MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

EPM1076 – INTRODUCTION TO MACHINES AND POWER SYSTEMS

(TE, RE)

12 MARCH 2018
09:00 a.m – 11:00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This Question paper consists of **4** pages excluding cover page with **4** Questions only.

2. Attempt **ALL** questions in the Question Paper. All questions carry unequal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

QUESTION 1

a) A 25kVA, 4400/2200-V, 60Hz transformer is to be tested to determine its excitation branch components, series impedances and voltage regulation. The following test data have been carried out from primary side of the transformer:

Open circuit test	Short circuit test
$V_{oc} = 4400V$	$V_{sc} = 42V$
$I_{oc} = 2A$	$I_{sc} = 6A$
$P_{oc} = 70W$	$P_{sc} = 160W$

i) Find the approximate equivalent circuit of this transformer referred to the high voltage side.

[9 marks]

ii) Calculate the full load voltage regulation when the power factor is unity .

[6 marks]

b) Draw the equivalent circuit diagrams of DC shunt motor and DC series motor.

[4 marks]

c) Draw a diagram showing the construction of a synchronous machine. Name the parts. A 6-pole synchronous machine operates as a motor from a three phase 400V, 50 Hz supply. What will be its speed?

[6 marks]

Continued .....

QUESTION 2

a) In a 110 V DC compound generator, given that the armature, shunt and series winding resistances are 0.06Ω, 25Ω, and 0.04Ω respectively. This machine is going to supply electricity power to a LED lamp which rated at 55kW, 110V.

i) Find the total emf and armature current if the machine is configured in long shunt connection.

[8 marks]

ii) For the machine is connected as in (i), describe how the behavioural of MMF generated by series winding be changed when a diverter with resistance of 0.1Ω is connected across the series field.

[2 marks]

Assume the armature reaction and brush dropping are ignored.

b) A 480V, 50Hz, star-connected 6 poles synchronous generator has a per phase synchronous reactance of 0.3Ω. Its full load armature current is 60A at 0.85 lagging power factor. This generator has friction and windage losses of 1.5kW, and core losses of 1kW at full load. Assume copper losses are negligible due to negligible armature resistance. The field current has been adjusted so that terminal voltage is 480V at no load. Determine the:

i) rotational speed of the generator,

[2 marks]

ii) generated emf voltage of the generator,

[5 marks]

iii) efficiency of the generator,

[7 marks]

iv) voltage regulation, and

[2 marks]

v) shaft torque must be applied by the prime mover.

[4 marks]

Continued .....

QUESTION 3

a) Explain the advantages and disadvantages for setting up of a nuclear power plant in Malaysia. [8 marks]

b) Describe the role of a transformer in a typical power system. [4 marks]

c) Draw a neat sketch giving the layout diagram of a hydro power generating station. Explain the function of main components of the power generating station. [13 marks]

Continued .....

QUESTION 4

a) Identify the basic components in a power system protection scheme and describe the main function of each component in brief.

[10 marks]

b) Figure Q4b shows a distribution system protection scheme using IDMT delay relay. Determine the TMS and operating time of relay 1 for fault at Bus C. Assume the plug setting current (PS) to be 1A both for relay 1 and 2. The CB operating time is 0.35 sec. TMS of relay 2 is 0.2. The PSM versus the operating time (T) is given as:

Table Q4b

PSM	30	20	15	10	5
T (sec)	2.0	2.3	2.7	3.3	4.5

*Operating time of relay = T X TMS

[10 marks]

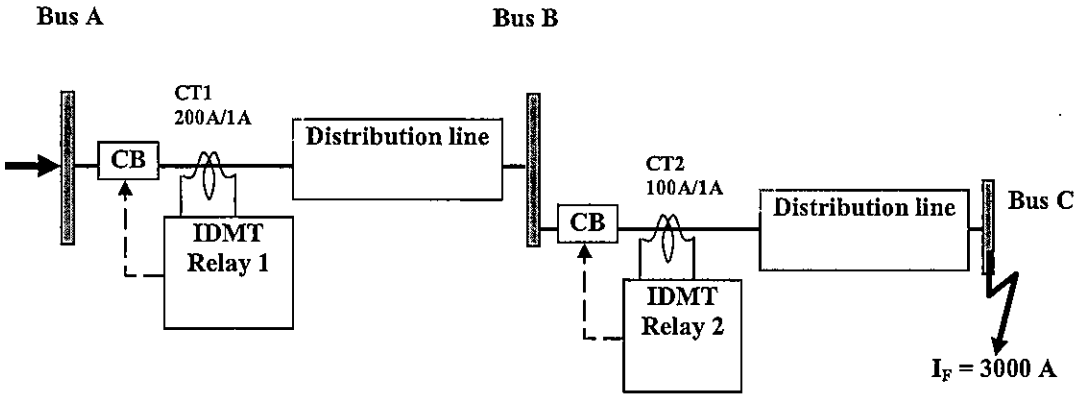

Figure Q4b

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